

The following abstracts do not represent all research projects funded in this program. Additional abstracts will be posted as awards are finalized. Please check back periodically for a more complete listing.

IMPROVING HUMAN NUTRITION FOR OPTIMAL HEALTH

Panel Manager - Dr. Sung I. Koo, Kansas State University

Program Director - Dr. Etta Saltos

This program area emphasizes research that contributes to our understanding of appropriate dietary practices throughout the life cycle and factors that affect these requirements such as gender, race and ethnicity. In addition, new insights are needed about factors that affect the attitudes and behavior of consumers toward food. The following areas of research will be emphasized: nutritional requirements including metabolism and utilization for all age groups, bioavailability of dietary components, mechanisms underlying the relationship between diet and optimal health (such as the effect of nutrients on the immune system) and cellular and molecular mechanisms influencing nutritional status (including nutrient effects on gene expression). In addition, this program supports research on identification of obstacles to adopting healthful food habits with particular emphasis on factors affecting consumer attitudes and behavior and development of recommendations for interventions to improve nutritional status. Innovative approaches to these research problems are encouraged.

2001-00627 Effectiveness of Natural Dietary Folate in Improving Folate Status

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Grant 2001-35200-10678; \$200,000; 3 Years

Inadequate folate status is associated with increased risk for heart disease, neural tube defects (NTD) and cancer. In an effort to reduce NTD risk, synthetic folic acid (FA) was added to enriched cereal grain products. Fortification is estimated to provide an additional 100 g/day FA which is less than the Institute of Medicine's 1998 recommendation that all women of childbearing age consume 400 g/day FA. The focus of this recommendation is on FA because the effectiveness of natural dietary folate in lowering NTD risk is unknown. In addition, data regarding the effectiveness of dietary folate in improving folate status are inconclusive. The 1998 folate RDA for adults is 400 mg/day as dietary folate equivalents (DFE), units that recognize the difference in absorption between dietary folate and FA. Although it is widely recognized that the absorption of dietary folate is less than FA, only limited data exist from which to draw comparisons (i.e., equivalency information). We propose to investigate the effectiveness of dietary folate in improving folate status and to evaluate the dietary folate equivalency of FA as part of a mixed diet. Nonpregnant women (18-45 y; n=24) will consume a low folate diet for 7 weeks followed by randomization to either 400 or 600 DFE derived solely from dietary folate or from a combination of dietary folate and FA for 7 wk. We predict that natural dietary folate will be effective in satisfying folate dependent pathways that may play a role in reducing risk for heart disease, NTD and cancer.

2001-00981 Dietary Patterning and Obesity Through Adolescence

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Grant 2001-35200-10658; \$250,000; 2 Years

This project will clarify the relationship between dietary intakes and rapidly rising rates of overweight and obesity in adolescent girls in the United States. Macronutrient analysis has not provided adequate information for understanding the relation between eating and overweight. Therefore this project will create a whole food database by reformulating an extensive existing nutrient database which was created from food records collected over a 10-year period from the large bi-racial National Heart, Lung and Blood Institute National Growth and Health Study (NGHS) cohort of girls aged 9-10 at baseline. The reformulated whole food database will provide the tools to examine the effects of dietary patterns in early- to mid-adolescence on various parameters of weight and body fat in mid to late adolescence, including pattern of weight gain and development of obesity. The reformulated whole food database will facilitate: a) identification of adolescent eating patterns; b) tracking eating patterns from childhood through adolescence; c) differences in adolescent eating patterns by race; and d) effects of childhood eating patterns on adolescent obesity. Further, we will use the reformulated whole food database together with a comprehensive annual database, collected concurrently from the NGHS cohort over 10 years, to evaluate the effect of eating patterns as a mediator between environmental risk factors, and adolescent obesity, providing key information for the development of intervention programs targeted at adolescents.

2001-00836 Bone Mass in Relation to Sodium Intake in Older Women

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Standard Strengthening Award; Grant 2001-35200-10657; \$246,000; 2 Years

There is considerable evidence showing that higher sodium intake causes bone loss in animals and increases urinary calcium excretion in humans and animals. However, studies evaluating its direct adverse effect on bones in humans are scarce. This research is testing whether the elderly women with higher sodium intake will lose more bone mass over a 2-year period in different skeletal sites, compared to women with lower sodium intake. The goal of this longitudinal clinical trial is to assess bone mass of the arm, spine, hip and total body at baseline and every 6 months with regard to different sodium intakes, in 136 healthy Caucasian women, 60-85 years old. Half of the subjects are instructed to reduce sodium intake to 1.5 g/day, while other half remains at usual intake of about 3.5 g/day. All subjects are instructed to maintain the recommended calcium intake of about 1.2 g/day, and are supplemented if necessary. Height, weight, blood pressure, blood and urine analyses, taste preference tests for salt, and complete dietary, activity, and life style factors are assessed as well, every three- and/or six-months. The adherence to sodium and calcium diets is assessed and reinforced by using the Transtheoretical Model of Behavior Change. Parathyroid hormone, vitamin D, and markers of bone turnover are analyzed in blood and/or 24-hour urine samples. The results will give more insight into and fill gaps in our knowledge about the complex relationship between calcium, sodium and bone metabolism, and possibly clarify the effect of sodium on bone mass in elderly women.

2001-00630 The Effect of Soy Protein and Isoflavones on Bone in Older Women

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Standard Strengthening Award; Grant 2001-35200-10674; \$250,000; 3 Years

Osteoporosis, a bone thinning disease leading to hip and spine fractures, primarily affects older women. In countries in Asia people eat larger amounts of food containing soybean products than the average person in the U.S. A recent study demonstrated that higher soy intake is associated with higher bone density (or bone strength) in Asian women. Soy foods are rich sources of compounds called isoflavones and they may be responsible for the health benefits of soy. Although some studies suggest that soy is beneficial to bone, few well-controlled clinical trials have been completed to adequately test this theory. Many women in the United States are demanding more natural treatments for chronic diseases and a substantial proportion of women are already consuming more soy products or using isoflavone supplements. However, it is unclear if these practices are beneficial to women who are past menopause. We propose to answer three major questions regarding the use of soy products in older women: 1) Does soy protein affect bone? 2) Will isoflavone supplements affect bone? 3) Will soy protein plus isoflavone supplements have a greater effect on bone than either alone? In order to answer these questions, we will complete a 1 year study in which women over age 70 years will be randomly assigned to one of 4 groups: control protein plus a placebo tablet; control protein plus isoflavone tablet, soy protein plus placebo tablet, soy protein plus isoflavone tablet. The study will measure bone density and bone turnover (or activity) at baseline and after 1 year of treatment.

2001-00556 Vitamin D Deficiency and Auditory Function of Genetically Disordered Mice

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Grant 2001-35200-10677; \$225,000; 2 Years

Approximately 28 million people in the U.S. are deaf or hard of hearing. Age-related hearing loss is the most common auditory disorder. Hearing impairment occurs in more than 300 genetic disorders. The investigators have found that nutritional disorders, such as poor vitamin D and calcium status, are associated with age-related hearing impairment in healthy humans as well as in mice with genetic defects in their auditory system. They will explore the relationship of vitamin D deficiency with auditory function in four strains of mice (CBA/CaJ, C57BL/6J(B6), BALB/c, and DBA/2J(D2) that vary in their genetic vulnerability to hearing loss. The specific objectives of the research are to determine the influence of vitamin D deficiency on accelerating the progression of hearing loss in mice with genetic disorders of hearing function and the effect of vitamin D repletion on the restoration of hearing function following vitamin D deficiency. The investigators propose that vitamin D-depletion will accelerate hearing loss to the greatest extent in mice with genes for hearing loss, but vitamin D-repletion will only partially restore auditory function following vitamin D deficiency. The results of this research will provide new insight into the roles of vitamin D and genetics in age-related hearing loss.

2001-00551 Symposium on Functions and Actions of Retinoids and Carotenoids: Building on the Vision of James Allen Olson

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Conference Grant; Grant 2001-35200-10634; \$10,000; 6 Months

A symposium on functions and actions of retinoids (vitamin A compounds) and carotenoids was held June 21-24, 2001, at Iowa State University. The symposium was designed to honor the

research and public service contributions of Professor James Allen Olson who died in September, 2000. Dr. Olson, who was a pioneer in vitamin A and carotenoid research, contributed to a wide range of health issues that are dependent on vitamin A and carotenoids, both in his laboratory research and in direction of national and international nutrition policy. An essential aspect of the agricultural enterprise in the U.S. is the effective use of foods to maintain good health. The identification and correction of malnutrition - either inadequacy or excess - accords well with the guidelines for research for U.S. Agriculture. This meeting presented a rare opportunity for researchers in both the vitamin A and carotenoids fields to meet together and address health issues involving assessment and eradication of vitamin A deficiency, absorption and conversion of carotenoids to vitamin A, and the relationship between carotenoids and cancer and macular disease. Besides findings on basic research on retinoids and carotenoids, the role of retinoids and carotenoids on immune functions, and possible clinical use of a water-soluble form of vitamin A in cancer and skin therapy were presented by leading experts from within the U.S. and abroad. This symposium fostered interactive collaborations among participants and speakers, brought attention to different fields of study, and brought new ideas, methods and materials to the attention of other researchers.

2001-01054 Antiatherogenic Properties of Zinc

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Grant 2001-35200-10675; \$260,000; 3 Years

There is evidence that zinc requirements are increased during periods of stress, trauma, or inflammation. Decreased plasma zinc concentrations are observed during stress, and the investigators hypothesize that vascular endothelial cells within the blood vessels are deprived of normal zinc levels during an inflammatory response, as occurs in cardiovascular disease. High levels of dietary polyunsaturated fats may increase cellular oxidative stress and further compromise the health of blood vessels. Preliminary studies suggest that zinc deficiency exacerbates the detrimental effects of unsaturated fatty acids and inflammatory cytokines on vascular endothelial cell function. Hence, the investigators hypothesize that zinc requirements of the endothelium are increased during inflammatory conditions such as cardiovascular disease. They propose that zinc inhibits oxidative events and the pathways of signal transduction leading to disruption of endothelial cell integrity. Using cell culture and animal models, they will explore mechanisms of the interaction of lipids and cytokines with regard to endothelial injury and the possible protective functions of zinc.

The long-term goals of this research are to determine zinc nutrition and requirements of endothelial cells, with implications of understanding the protective role of zinc in diseases or disorders such as atherosclerosis. This research is relevant to U.S. Agriculture. Atherosclerosis is a significant cause of poor health in the U.S., and the proposed studies may help to explain the influence of zinc malnutrition on this disease, especially in people who consume diets high in polyunsaturated fatty acids.

2001-0828 Mechanisms of Leptin Resistance in Diet-Induced Obesity

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Grant 2001-35200-10817; \$250,000; 3 Years

Accumulation of excess adipose tissue is a known risk factor for hypertension, heart disease and non-insulin-dependent diabetes mellitus. The epidemic of obesity in Western society is strongly associated with consumption of high fat diets. A subset of this population is sensitive to the diabetes

promoting effects of high fat in that their obesity progresses to insulin resistance and eventually diabetes. A similar variation in sensitivity to high fat diets has been documented among mouse strains. For instance, C57BL6/J mice develop an obese/diabetic syndrome when reared on high fat diets, while mice of the A/J strain develop none of these pathologies. Thus, the C57BL6/J mouse provides an excellent model to study the developmental stages of an obese/diabetic syndrome that is highly analogous to human non-insulin-dependent diabetes mellitus. The implication of these studies is that high fat diets inhibit the actions of the recently identified hormone, leptin, to limit food intake and/or stimulate energy utilization in the fat-sensitive C57BL6/J strain. In studies completed to date, the investigators have found that high fat diets compromise the ability of the brain to sense circulating leptin and compromise the ability of adipose tissue to respond to signals from the brain. In this study, they will test the hypothesis that high fat diets limit the ability of leptin to regulate specific genes that are necessary to avoid obesity. Identification of such genes and understanding how they become dysregulated in fat-sensitive mouse strains will facilitate identification of their human homologues, and provide a way to screen and intervene in individuals predisposed to develop diabetes when consuming a typical high fat Western diet.

2001-00808 Suppressed Cell Proliferation and Differential Gene Expression by N-3 Fatty Acids
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Grant 2001-35200-10721; \$165,000; 3 Years

Results from long-term human studies indicate that taking aspirin-like drugs can reduce the incidence of colon cancer. Aspirin-like drugs inhibit an enzyme responsible for producing hormone like substances called prostanoids. The levels of this enzyme and prostanoids are much higher in colon tumor tissues than normal tissues. Results from studies using laboratory animals have also demonstrated that inhibiting this enzyme leads to a reduction of the risk of colon tumors. It has been well known that consuming seafood can inhibit the production of prostanoids in the body, and fat contained in seafood can suppress the tumor growth. Thus, this suppression has been considered to be due to inhibition of production of prostanoids by the type of fat (N-3 fatty acids) contained in seafood. However, results from the investigators' recent studies suggest that suppression of tumor growth by the fat may be mediated through other mechanisms in addition to the inhibition of the production of prostanoids. Thus, the goal of the proposed studies is to elucidate the mechanisms of action of the fat contained in seafood in suppressing tumor growth. Results from the proposed studies can help in assessing optimal or desirable levels of intake of the different types of dietary fats to promote health. Because N-3 fatty acids can also be produced in plants, the health benefits of consuming seafood may also be obtained by consuming plant products containing these fatty acids. This can impact the development and production of crops containing N-3 fatty acids.

2001-00638 Mechanisms of Selenium Incorporation During Protein Synthesis

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Grant 2001-35200-10692; \$260,000; 3 Years

The essential nutrient selenium substitutes for the usual sulfur atom in selenocysteine, one of the amino acid "building blocks" of proteins. These selenium-containing proteins play important roles in the body's defense against oxidant damage and cancer, as well as in fertility and in growth and development. The incorporation of selenocysteine into proteins is directed by an unusual DNA sequence: the piece of the genetic code that specifies this amino acid is one that is usually utilized

as a “stop” signal to terminate protein synthesis. The correct reading of this code element as selenocysteine depends upon a structure, termed the selenocysteine insertion sequence (SECIS), in a downstream region of the messenger RNA molecule that directs protein synthesis. We have identified two proteins that recognize and bind to the SECIS. The proposed studies will examine the function of these proteins, nucleolin and DNA-binding protein B, and determine their role in the synthesis of selenium-containing proteins. The results should provide new insight into the molecular mechanisms by which selenium nutrition controls the synthesis of these unusual but important proteins. They will also help to provide a sound scientific basis for the poorly-understood requirement for selenium in human and animal nutrition.

2001-00989 FASEB Conference: Molecular Mechanisms of Regulation by Dietary Constituents

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Conference Grant; Grant 2001-35200-10633; \$10,000; 6 Months

The 2001 FASEB Summer Conference on *Molecular Mechanisms of Regulation by Dietary Constituents*,” was held August 18-23 at the Vermont Academy in Saxtons River, Vermont. The purpose of the conference was to bring together scientists interested in the regulation of cell biology by nutrient and non-nutrient factors that are found in diets and that are thought to influence health.

The organizers used this conference to bridge the intellectual and content gaps common in a multi-disciplinary field such as nutrition. They also provided an optimal learning environment for young investigators and for nutritionists looking to bring molecular tools to their research. The conference consisted of 9 major oral sessions, each comprised of four 45-minute talks (30 minutes of presentation, 15 minutes of discussion). The conference began with a plenary lecture by a leader in the field. The other sessions were organized around levels of molecular regulation. Nutrient control by macronutrients (protein, carbohydrates, fat), micronutrients (vitamins and minerals), and food components that are not required nutrients (e.g. isoflavones, carotenoids) were included. Other sessions were dedicated to *Hot topics*,” i.e. genetically modified animal models, interactions between diet/nutrients and genetics, and functional genomics. Poster presentations were available throughout the conference; two afternoons were scheduled for interaction around the posters. The conference filled a void in the field by bringing together people with common conceptual and methodological approaches to problems related to nutrition and health.

2001-00995 FASEB Summer Conference on Micronutrients: Trace Elements

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Conference Grant; Grant 2001-35200-10611; \$10,000; 1 Year

The FASEB Summer Conference on Micronutrients was held June 2-7, 2001. The site of the conference was Big Mountain Ski and Summer Resort in Whitefish, Montana. The goals of the conference were to promote the interchange of scientific information and ideas, to encourage the development of collaborations, and to involve young investigators in the conference with the aim of giving them access to established investigators in this rapidly developing field. Trace elements are essential to the health and well-being of humans and are essential for many agricultural endeavors, including plant and animal production. Trace element metabolism and function has just begun to be understood in the past 10 years. In the 2 years since the last conference took place, there have been significant advances in trace element research. This conference focused on those recent advances in iron, copper, zinc, and selenium metabolism and function. The scientific presentations

were given in 9 oral sessions, 2 poster sessions, and 1 workshop. Ample time was available for informal discussions, both indoors and outdoors. Thirty-eight speakers participated and a third of them are young investigators. All were chosen because of their recent meritorious contributions to the scientific literature on trace elements.

2001-01012 Manganese, Proteoglycan-Lipoprotein Interactions and Arterial Wall Functional Properties

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Seed Grant; Grant 2001-35207-10726; \$70,206, 2 Years.

Glycosaminoglycans are the “cement” of the arteries and they have been implicated in the development of cardiovascular disease (CVD). Results from the investigator’s laboratory revealed decreased total glycosaminoglycan (GAG) concentrations stemming from significant reductions in chondroitin sulfate and heparan sulfate in manganese (Mn) deficient rat aortae. Objectives of the proposed study are to determine the effect of Mn on the functional and mechanical properties of the aorta and the binding of low-density lipoprotein (LDL) to arterial GAGs, such as chondroitin sulfate and their relationship to CVD. Weanling Sprague-Dawley rats will be fed diets with several levels of manganese i.e. manganese deficient (MnD 0.1 ppm), manganese adequate (MnA10 ppm), manganese supplemented MnS 50 ppm), and a manganese deficient + 50 ppm diet (MnR) for thirteen weeks. LDL from rat plasma will be isolated by density gradient centrifugation. LDL will be oxidized with copper sulfate in the presence of GAGs (chondroitin sulfate) from the aortae of the different dietary groups. Oxidation will be followed by monitoring conjugated dienes and low level chemiluminescence. Mechanical and functional properties of arterial rings such as vascular reactivity and distensibility, will be tested with both antagonist and agonist stimulation in the different diet groups. Considering the high incidence of CVD in the U.S., the above project is in accordance with the goal of the U.S.D.A. to unravel mechanisms between diet and health maintenance and disease prevention and optimal health.

2001-00998 Biochemical Assessment of Nutritional Copper Status

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Grant 2001-35200-10676; \$250,000; 3 Years

Copper is an essential element for optimal cellular function of both animals and plants. There is uncertainty as to the precise dietary copper requirement for humans even though a recent dietary reference intake (DRI) was established. Most research on copper requirements has focused on healthy adult men or postmenopausal women. However, optimal nutrition is especially important during neonatal development. For example, lack of sufficient copper is known to have a major impact on the development and maintenance of the central nervous system both in experimental animals and humans. By analogy to another essential dietary metal, iron, failure to accumulate copper during brain development may lead to permanent alterations in behavior, and diminished cognitive capacity. To determine the copper requirement necessary to support optimal human development more sensitive indicators of nutritional copper status are needed. We have shown, in copper deficient rats, that the activity of the copper-dependent enzyme, peptidylglycine α -amidating monooxygenase (PAM), may be a useful indicator. The specific objectives of this focused project are to investigate the utility of PAM as a marker for humans using a combination of experiments in

Sprague-Dawley rats studying dietary copper deficiency and studies using human serum from subjects of various age groups and copper status states received from several collaborators. These studies will aid in the establishment of a biochemical marker of nutritional copper status and will also enhance our understanding of the important role that copper plays in biological systems.

2001-00557 Using the Stages of Change Model to Increase Fruit and Vegetable Intake

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Grant 2001-35200-10638; \$400,000; 3 Years

This project seeks to develop an effective intervention for increasing fruit and vegetable intake in the U.S. A computerized expert system will be used to create individualized intervention materials. The expert system is designed around principles of change that have been shown to help people decide on taking action for changing health risk behaviors. Young adults across the U.S. who agree to participate will be asked about their fruit and vegetable intake and their readiness to eat more. The intervention group members will receive individualized, computer-generated materials that are matched to their level of readiness to change. Repeated testing will be conducted at 3 and 6 months, followed by additional mailings of individualized materials. A final testing will be conducted at 12 months to determine if changes seen earlier have been maintained. By the end of the study, participants in the intervention group should have increased their fruit and vegetable intake. In addition, intervention group participants who were not ready to eat more fruit and vegetables at the initial testing, should have moved further toward taking action to increase intake than control group participants. The long-term goal of this project is to develop a model, low-cost, individualized intervention appropriate for hard-to-reach populations, like the young adult age group. With minor modification, this intervention should be effective with other age groups and other dietary behaviors. This project is relevant to U. S. agriculture's goal of improving nutrition to promote optimal health.

2001-00752 Equipment Grant: Kjeldahl

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Equipment Grant; Grant 2001-35207-10728; \$12,542; 1 Year

Protein is a critical nutrient for growth, maintenance and repair and immune functions in humans and other animals. The "gold standard" for protein assay is the Kjeldahl method (Association of Official Analytical Chemists 1997) which requires a Kjeldahl apparatus. There has never been a Kjeldahl apparatus in the research laboratory used by the Departments of Family and Consumer Sciences and Home Economics Extension. Researchers using this laboratory have had to go elsewhere on campus to do the assay or outsource the analysis. In this case, the nearest Kjeldahl apparatus is in another building necessitating transport of samples, which increases the risk of damage and/or contamination. That Kjeldahl is used for research and teaching, making scheduling problematic. Researchers in both departments detailed above will use the requested unit extensively. It will be used in the determination of protein content of diet ingredients, formulated diets and selected tissue samples. The digestion unit will be used for wet ashing various materials for mineral analyses. The overall apparatus will be used to obtain protein information related to formulated products. It will also be used to obtain information needed for the Nutrition Facts Label.

Two of the researchers in these departments work with cultured foods. They will use the Kjeldahl to determine the effects of positive and negative microbes on protein in the food.

2001-00754 Gas Chromatography for Lipid Analysis

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Equipment Grant; Grant 2001-35207-10724; \$17,012.00, 1 Year

The pecan crop of the southwest U.S. is one of the largest agricultural products of the region. Human nutrition clinical trials have established health benefits from eating pecans and other tree nuts. Most notable of these health benefits is the blood lipid lowering effect. Many of the health benefits associated with the consumption of pecans and tree nuts has been linked to the unique fatty acid profiles of these foods. The purpose of this research project is to conduct fatty acid analysis of southwestern pecan cultivars using gas chromatography. This will be done to compare the fatty acid composition of the different pecan cultivars grown in this region. The fatty acid profiles of pecans will be compared with those of other tree nuts and with groundnuts. The composition of fatty acids of pecans grown in different geographical regions can also be contrasted. The effect of growing conditions (irrigated versus rainfall) can also be explored to elucidate the effects on fatty acid profiles of these nuts. The understanding of the fatty acid composition of this important cash crop of the region will increase the knowledge of pecans. Nutritionists and the general public can potentially use the results of this research to improve health. Pecan producers could potentially use this information to market their product. Gas chromatography will also be used to determine the composition of gases inside foods packaged using modified atmosphere packing technology. This will be useful to the regional food manufacturing and food processing industry.

2001-00826 Gastrointestinal Uptake of Iron

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Grant 2001-35200-10723; \$230,000; 3 Years

Although iron is an essential nutrient, too much is toxic. Thus, while iron deficiency is the most common disorder in the world, iron overload is also a frequent problem in the U.S., due to the interaction of a common genetic disorder with the high fraction of red meat in most diets and the iron fortification of many foods. The investigators have found that the Belgrade rat has a mutation that makes it severely iron deficient. The mutation makes DMT1 (Divalent Metal Transporter 1, or DCT1 or Nramp2) lose its ability to move iron and several other metals. The rats=symptoms show that DMT1 is a major transporter of iron into the intestine and that it also helps move iron to tissues throughout the body. The investigators have also found that DMT1 has two forms that are similar but differ slightly in their structure and should differ in how they are regulated. They plan to measure the levels of DMT1 mRNA, activity, protein and the location of the two forms in intestines of normal and Belgrade rats under normal nutrition and after iron deficiency and overload to see how the variables correlate with iron status and with mutation in the DMT1 gene. The data to be obtained should provide new understanding that helps the USDA in its missions to improve human nutrition and animal production, particularly with respect to iron status. Because DMT1 can transport other metals, these studies are also relevant to nutrition and toxicity for manganese, nickel, cobalt, copper, zinc, cadmium and lead.

2001-00728 Acquisition of a Gravity Steam Sterilizer

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Equipment Grant; Grant 2001-35207-10727; \$20,854; 1 Year

Funds will be used to purchase a gravity steam sterilizer (autoclave). The equipment will be used to sterilize reagents, glassware, solutions, etc. as well as other liquid or solid requiring sterilization. Investigators in several departments will use the equipment. Antioxidants are used by the food industry to extend shelf life. One source of naturally occurring antioxidants is potato peel that contains a group of compounds called phenolics. These phenolics have been shown to work as antioxidant food preservatives. Antioxidants are also proposed to play a role in reduction of risk for several diseases, including cardiovascular disease, the number one cause of death in the US. The investigators are interested in the role of naturally occurring antioxidants, such as those found in potato peel, in reducing risks of diseases. It is not known if potato peel antioxidants will have any effects in living organisms. To investigate this possibility, surgical implantation of catheters into bile ducts, veins and/or arteries of experimental animals will be essential. The surgical instruments and supplies need to be sterilized before use. The popularity of the many forms of processed potato products in the American diet ensures many tons of potatoes are processed daily. The peel waste is currently used as animal feed or hauled out on fields as a means of disposal. Any use of the peel would Add value@to the potato crop, increasing demand and thereby, increasing the economic potential for the potato growers and associated industries. Conceivably, there is an expanded market for antioxidants nationwide and worldwide.

2001-00806 Regulation of Translation of the Arginine/Lysine Transporter by Amino Acid Availability

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Grant 2001-35200-10639; \$300,000; 3 Years

Amino acids are essential nutrients for protein synthesis, cell growth and maintenance. Transfer of amino acids into the different tissues is mediated by proteins that recognize, bind and transport these amino acids from the blood into the tissues and vice versa. Mammalian cells have developed a defense mechanism to changes in amino acid availability. When the amino acid supply is limited, protein synthesis decreases and there are increases in catabolism of cellular proteins, amino acid biosynthesis, and amino acid transport across the plasma membrane. Together these responses

provide the amino acids, which are essential for cell survival. A significant part of this adaptive response is the increased expression of the gene for the transporter of the essential amino acids arginine and lysine. This enables the amino acid depleted cells to transport amino acids once they become available. Moreover, arginine and lysine administration has beneficial effects under catabolic conditions such as occur during infection, trauma or surgery. Recently, the investigators discovered a novel mechanism that operates to increase synthesis of the arginine/lysine transporter protein under cellular stress conditions when protein synthesis is inhibited. The studies proposed will determine the molecular details of this mechanism. Delineation of the molecular mechanisms of regulation of

essential amino acid transport into mammalian cells under stress conditions will be a valuable guide to the design of diets to improve human health.

2001-00810 Iron Status and Immune Response in Homebound Older Women

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Grant 2001-35200-10722; \$260,000; 3 Years

The overall goals of this study are to systematically determine the effects of iron deficiency on tests of immune function in homebound older women, and to evaluate the functional benefits associated with improvement in iron status, in terms of improved immunity, in iron-deficient older women. The investigators' previous USDA-funded study showed a high prevalence of iron deficiency (19%) and anemia (15%) among homebound older women, based on multiple abnormal iron status tests. Furthermore, trends of impaired immune response with impaired iron status were noted. Thus, there is a need for a carefully designed follow-up study, involving comprehensive and precise assessment of iron status and immune response, to examine the differences between iron-deficient versus iron-sufficient older women in immune function. Effects of treating iron deficiency such as improved immunity have also not been fully examined, particularly in older adults. Restoring iron status could potentially have an even greater impact on improving immune function among this vulnerable at-risk population. The specific objectives are to examine differences in immune response and in adequacy of nutrient intake including total, heme, and nonheme iron in iron-deficient and iron-sufficient homebound older women, and in an intervention study with iron-deficient older women, examine the effects of iron supplementation on improvement in iron status and measures of immune capacity. The findings from this study will highlight the importance of detecting iron deficiency and need for follow-up with efforts to improve iron status, for potentially enhancing immunocompetence and the quality of life in a vulnerable group of homebound older women.

2001-00833 Long-term Effects of Docosahexaenoic Acid (DHA) Intake During Early Infancy

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Grant 2001-35200-10720; \$180,000; 3Years

Docosahexaenoic acid, or DHA, is a special fatty acid that is concentrated in the brain and retina where it is crucial for optimal development. DHA is present in breast milk but the amount depends, in part, on the mother's diet. The investigators recently completed a study in which breastfeeding mothers were given either DHA or a placebo for four months. They found expected differences in milk DHA but no differences in visual function at four and eight months of age or cognitive/psychomotor development at 12 or 18 months of age between infants of mothers who received DHA versus placebo. However, at 30 months of age, infants of mothers who received DHA performed better on a standard test of psychomotor function. The aim of the current study is to determine if this difference persists and if there are other long-term effects of early DHA supplementation on development. To do this, the investigators will assess developmental indicators at about six years of age. The results will help determine if some breastfeeding mothers should increase the amount of certain fats in their diets. If so, the study has relevance to U.S. agriculture, which must develop dietary sources of the needed fats.

2001-00846 Environmental Influences on Children's Food Consumption

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Children's intakes of fruit, juice, and vegetables (FJV) do not meet the recommended minimum of 5 daily servings, and thereby are associated with increased risk for development of cancer and several chronic diseases later in life. Children's food preferences and practices are initiated early in life, which suggests the need to learn more about this period to enable the development of more effective intervention programs. Families and child-care settings are important social environments within which food-related behaviors of young children are developed. This study consists of two parts. The goal of the Development Phase (Year 1) is to develop, field-test and validate measures for assessing food management practices (i.e. meal structure; adult modeling; child feeding practices; food socialization and mealtime behaviors; and parenting style) of child-care providers and parents. The goal of the Main Study (Year 2) is to identify the extent to which mealtime behaviors of child-care providers influences FJV consumption by preschool children. The target population of the proposed study represents African- and Mexican-American children attending Head Start centers. The proposed study addresses factors that influence eating behaviors of young children, which is one of the priority areas identified by the USDA National Research Initiative. This research will be helpful in identifying effective strategies that could be used with families and child-care providers to promote healthier eating behaviors early in life.

2001-00957 Acute and Chronic Effects of Cranberry Juice Consumption on Coronary Vascular Disease Risk Factors

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Seed Grant; Grant 2001-35207-10725; \$75,000; 15 Months

Heart disease remains the number one killer of Americans today. Dietary measures that can reduce the risk of heart disease remain to be entirely understood. Cranberry juice consumption is one dietary measure whose impact on heart disease risk factors has not been fully evaluated, but has the potential to provide benefits. This project examines how the consumption of cranberry juice could be used to reduce the risk of heart disease. The objectives of this study are to determine if cranberry juice consumption creates acute changes, up to 6 hours after consuming a single dose of juice, in brachial and coronary artery blood flow, platelet aggregation, antioxidant capacity, plasma flavonoid concentration, and insulin release. The study will also determine if cranberry juice consumption over a period of 60 days creates chronic changes in platelet aggregation, antioxidant capacity, plasma flavonoid concentration and insulin release, and whether effects are dose-dependent with respect to acute and chronic consumption. This project is relevant to USDA's goal of improving nutrition to promote optimal health.

2001-00838 Iron Regulatory Proteins and Fuel Utilization in Iron Deficiency

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Grant 2001-35200-10683; \$250,000; 3 Years

Iron deficiency is a common nutritional deficiency disease in humans and some production animals. Iron deficiency is a significant problem in newborn swine. In the U.S., piglets are given an iron supplement soon after birth. Iron deficiency can cause health problems independently of anemia. Iron deficiency can impair muscle function by causing a loss of iron proteins in muscle that

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